Remarks

Claims 1-33 are pending in the application.

Claims 1-33 are rejected.

Claim 1 is amended to correct a typographical error and claim 32 is amended to incorporate a limitation recited in claim 1.

Most of the following remarks have been orally presented to the Examiner on August 30, 2002 in a telephone interview. As suggested by the Examiner, Applicant includes the oral remarks in this reply for the Examiner's reconsideration.

I. Drawings

The Office Action states that FIG. 1 should be designated as prior art. Applicant has added the legend "(Prior Art)" following "FIG. 1" in FIG. 1. Applicant has enclosed a copy of a proposed drawing with changes marked in red and a copy of a corrected drawing for the Examiner's review and approval.

II. Claim Rejections – 35 U.S.C. §103

The Office Action rejects claims 1-33 under 35 U.S.C. §103 as being unpatentable over Applicant's Prior Art FIG. 1 (hereinafter "APAF1") in view of either U.S. Patent No. 5,394,343 issued February 28, 1995 to Tsao (hereinafter "Tsao") or U.S. Patent No. 5,544,000 issued August 6, 1996 to Suzuki et al. (hereinafter "Suzuki"). U.S. Patent No. 5,847,442 describes the function of APAF1. See page 2, line 15-page 3, line 15 of the specification.

(a) APAF1 in view of Tsa

The Office Action rejects claims 1-18 and 23-31 under 35 U.S.C. §103 as being unpatentable over APAF1 in view Tsao.

The Office Action states that APAF1 discloses a temperature compensation circuit comprising a feedback resistor in which the conductivity is responsive to changes in temperature and a switch (22) to couple a voltage to input word lines (28). The Office Action goes on to state that the ROM in APAF1 uses a plurality of data resistors (30) to connect the plurality of input lines and output lines (40). The Office Action states that APAF1 does not disclose a constant current source coupled to at least one reference resistor. The Office Action, however, relies on Tsao, col. 5, lines 12-18, disclosing a constant current source coupled to a reference resistor (52). The Office Action also asserts that the voltage to input word lines (28) is the voltage developed across the reference resistor (52).

Claim 1 recites a temperature compensation circuit in a ROM to maintain a current through a selected one of a plurality of data resistors substantially constant, comprising at least one reference resistor, wherein the conductivity of said reference resistor is responsive to changes in temperature. A constant current source coupled to the at least one reference resistor develops a voltage across the at least one reference resistor. At least one switch connected to the reference resistor selectively couples said voltage to a plurality of input word lines, wherein the ROM device uses the plurality of data resistors to interconnect the plurality of input word lines with a plurality of output bit lines.

First, it is clear from the Office Action that the feedback resistor in APAF1 is not the recited reference resistor because the Office Action assigns the resistor 52 in Tsao as the reference resistor. APAF1 includes a temperature compensation circuit that includes the feedback resistor for maintaining the output voltage of the sense amplifier 42 substantially constant. See page 3, line 22-page 4, line 5. Even assuming that the Office Action is interpreted to state that the feedback resistor can be the reference resistor, the Office Action does not explain how APAF1 can be modified to incorporate the teaching in Tsao. Further, the combination would defeat the function of the ROM in APAF1.

The details of the sense amplifier 42 is shown in FIG. 3, where element 41 is the feedback resistor. See page 7, lines 11-16. In order to maintain the output voltage substantially constant, the resistance of the feedback resistor 41 must vary with temperature such that when the gain of the sense amplifier 42 decreases, the resistance of the feedback resistor decreases. See page 4, lines 2-5.

Claim 1 recites that a constant current is coupled to the reference resistor to develop a voltage across the reference resistor and at least one switch is connected to the reference resistor to selectively couple the developed voltage to a plurality of input word lines. Thus, if the feedback resistor 41 is the reference resistor, a constant current must be provided to the feedback resistor 41, the feedback resistor 41 must be connected to at least a switch, and the switch must couple the voltage developed across the feedback resistor 41 to a plurality of input word lines. As shown in the figures below, the feedback resistor 41 and the

associated sense amplifier 42 are located at the output bit lines, there is no way that the voltage developed across the feedback resistor can be coupled to the input word lines through element 22 (relied upon as a switch in the Office Action). Furthermore, if a constant current source is applied to the feed back resistor 41, the output voltage of the sense amplifier 42 will always be present regardless the state of the data resistors. Thus, it defeats the function of the ROM.

FIG. 3

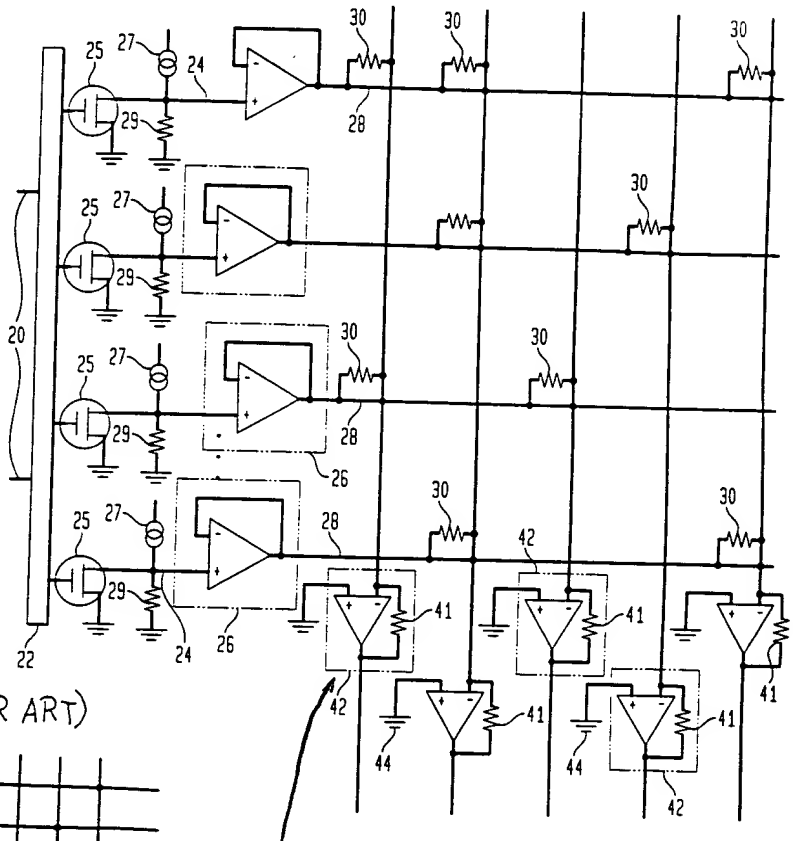
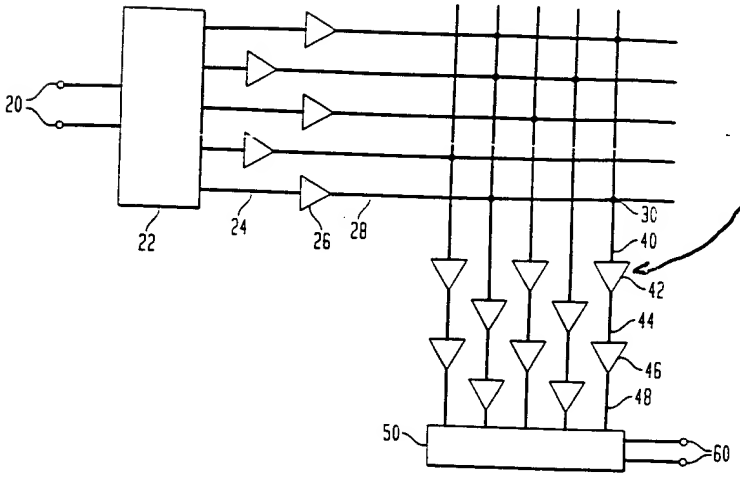


FIG. 1 (PRIOR ART)



Second, APAF1 does not disclose or suggest a switch to selectively couple the voltage to a plurality of input word lines. Element 22 in APAF1 is actually a shift register or a ring counter, not a switch as suggested in the Office Action. See U.S. Patent No. 5,847,442, col. 3, lines 28-30. As known in the art, a shift register shifts an input signal from one output to the next in each clock cycle. On the other hand, a switch takes an input signal directly to an output when the switch is in a closed position. The input signal is not shifted to another output in a sequence of clock cycles. Here, the shift register does not connect the reference resistor to a plurality of input word lines as required in claim 1.

Third, claim 1 recites that the temperature compensation circuit comprises at least one reference resistor, wherein the conductivity of the reference resistor is responsive to changes in temperature. By contrast, Tsao teaches away from applicant's invention. Tsao states that the resistor 52 need not be responsive to changes in temperature, when a constant current source is used. See Tsao, col. 5, lines 30-32. When the resistor 52 is replaced by a thermistor -- which is responsive to changes in temperature -- the constant current source recited in claim 1 is not required by Tsao. See id.

Fourth, claim 1 recites that the at least one switch selectively couples the voltage developed across the at least one reference resistor to a plurality of input word lines. Although the Office Action states that it is inherent that a voltage is developed across the resistor 52 in Tsao, the Office Action does not explain how the voltage developed across the resistor 52 can be selectively coupled to a plurality of input word lines by element 22 (relied upon as a switch in the Office

Action) in APAF1. Furthermore, Tsao, either alone or in combination with the other cited references, does not disclose of suggest selectively coupling resistor 52 to plurality of word lines via element 22.

Last, there is no motivation to combine APAF1 with Tsao for reducing errors resulting from temperature changes as suggested in the Office Action (at 5) because APAF1 has already solved that problem. As pointed out in the Office Action, APAF1 already includes a temperature compensation circuit. The temperature compensation circuit uses a feedback resistor to maintain the output voltage of a sense amplifier 42 substantially constant, thereby reducing sensing errors resulting from temperature changes. See page 3, line 16-page 4, line 5. Thus, like Tsao, APAF1 already solves the problem of reducing errors resulting from temperature changes. The new compensation circuit disclosed in applicant's specification is intended to solve a different problem: improving the switching speed, not reducing data sensing errors as suggested by the Office Action. See page 4, lines 6-10. Generally, the switching speed is the time it takes to read a bit, so that another bit can be read. Thus, there is no motivation to combine APAF1 with Tsao because both are proposed solutions to the same problem, and therefore any combination would be at best redundant.

From the reasons above, claim 1 is patentable over the two references.

Similarly, claims 2-18 are patentable based on their direst or indirect dependence from claim 1.

Furthermore, claim 2 recites that the electrical conductive properties of the reference resistor are selected to be the same as the electrical conductive

properties of the data resistors. Although Tsao discloses that the resistor 52 can be replaced by a thermistor, it does not disclose or suggest that the electrical conductivity of the resistor 52 and associated properties are selected to be the same as those of the data resistors. See Tsao, col. 5, lines 29-32.

Similarly, claim 7 recites that a change in electrical conductive properties of said reference resistors matches a change in electrical conductive properties of the data resistors. As discussed above with respect to claim 2, Tsao does not disclose or suggest this feature.

Claim 23 recites a temperature compensation circuit to maintain a current through a selected one of a plurality of data resistors substantially constant comprising at least one voltage source producing a voltage that is responsive to changes in temperature, and at least one switch connected to said at least one voltage source to selectively couple said voltage to a plurality of input word lines, wherein the ROM device uses said plurality of data resistors to interconnect said plurality of input word lines with a plurality of output bit lines. Applicant repeats the remarks made above with respect to claim 1 and requests the withdrawal of the rejection.

Similarly, claims 24-31 are patentable based on their direct or indirect dependence from claim 23.

(b) APAF1 in view of Suzuki

The Office Action rejects claims 19-22, 32, and 33 under 35 U.S.C. §103 as being unpatentable over APAF1 in view of Suzuki. The Office Action states that APAF1 discloses those elements as described above in Section II(a) but

does not disclose the step of maintaining the current by supplying a reference voltage to input lines, in which the reference voltage is the voltage developed across a temperature responsive reference resistor when a constant current is applied to the reference resistor. The Office Action, however, states that Suzuki at col. 6, lines 20-35 discloses a sensing method. The Office Action argues that the sensing method includes the step of maintaining a constant current in a temperature compensation circuit by supplying a reference voltage to input lines wherein the reference voltage is responsive to a change in temperature.

The Office Action does not specify which resistor is the reference resistor in Suzuki. It appears that the Office Action meant resistor R1 in Figure 11 of Suzuki because R1 is a temperature sensitive resistor. See Suzuki, col. 6, lines 23-28.

Claim 19 recites a method to maintain a current through Read-Only Memory (ROM) substantially constant as temperature changes, comprising the steps of selecting a reference resistor wherein said ROM employs a plurality of data resistors to provide electrical interconnections between a plurality of input lines and output lines and a change in electrical conductive properties of said reference resistor matches a change in electrical conductive properties of said data resistors; supplying a reference voltage to said input lines, said reference voltage developed by supplying a constant current to said reference resistor, wherein said reference voltage is responsive to a change in temperature.

Thus, claim 19 recites that a change in electrical conductive properties of said reference resistor matches a change in electrical conductive properties of

said data resistors. Although Suzuki discloses that R1 is temperature sensitive, it does not disclose or suggest that a change in the electrical conductive properties of R1 (or other resistors) matches a change in electrical conductive properties of the data resistors.

Furthermore, claim 19 recites supplying a constant current source to the reference resistor. As disclosed in Suzuki, the current applied to R1 (relied upon as the reference resistor) is not a constant current as recited in claim 19 -- rather the output voltage 11 from the temperature compensation circuit 51 (which includes R1) drives circuit 52 to generate a constant current. See Suzuki, col. 6, 31-34.

Furthermore, the Office Action does not explain how circuit 51 in Figure 11 of Suzuki can be combined with the ROM circuit in APAF1. Applicant requests that the Examiner show the combination or withdraw the rejection.

Last, similar to the earlier discussion of combining with Tsao, there is no motivation to combine the teachings of APAF1 and Suzuki because APAF1 has already solved a similar problem, i.e., reducing errors resulting from temperature changes as suggested in the Office Action. As pointed out in the Office Action, APAF1 already includes a temperature compensation circuit. The temperature compensation circuit uses a feedback resistor to maintain the output voltage of a sense amplifier 42 substantially constant, whereby reducing sensing errors resulting from temperature changes. See page 3, line 16-page 4, line 5. Thus, like Suzuki, APAF1 already solves the problem of reducing errors resulting from temperature changes. The new compensation circuit disclosed in applicant's

specification is to solve a different problem: improving the switching speed, not reducing data sensing errors as suggested by the Office Action. See page 4, lines 6-10. Generally, the switching speed is the time it takes to read a bit, so that another bit can be read. Thus, there is no motivation to combine APAF1 with Suzuki because there is no need to do so.

From the reasons above, applicant believes that claim 19 is patentable.

Similarly, claims 20-22 are patentable based on their direct or indirect dependence from claim 19.

Claim 32, as amended, recites a method to maintain a current through Read-Only Memory (ROM) substantially constant as temperature changes, comprising the steps of supplying through at least one switch a reference voltage that is responsive to changes in temperature to a plurality of input lines, wherein said ROM employs a plurality of data resistors to provide electrical interconnections between said plurality of input lines and a plurality of output lines and said reference voltage changes to maintain said current through said data resistors substantially constant.

Thus, claim 32 recites at least a switch for supplying the reference voltage. As discussed above with respect to claim 1, APAF1 discloses a shift register (element 22 in APAF1), not a switch as suggested by the Office Action. Here, the reference voltage is not supplied through the shift register.

Furthermore, Applicant repeats the remarks made above; namely, there is no motivation to combine the two teachings with respect to claim 19.

Furthermore, the Office Action does not explain how circuit 51 in Figure 11 of Suzuki can be combined with the ROM circuit in APAF1 as discussed above with respect to claim 19.

From the reasons above, claim 32 is patentable over the two references.

Similarly, claim 33 is patentable by its dependence from claim 32.

III. Summary

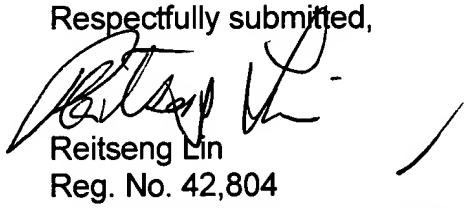
Having fully addressed the Examiner's rejections, it is believed that in view of the preceding remarks, this entire application stands in a condition for allowance. If, however, the Examiner is of the opinion that such action cannot be taken, he is invited to contact the Applicant's attorney at the number and address below in order that any outstanding issues may be resolved without the necessity of issuing a further Action. An early and favorable response is earnestly solicited.

IV. CORRESPONDENCE AND FEES

Please address all correspondence to Customer No.: 26345. All telephone calls should be made directly to Reitseng Lin at 973-596-4717.

If any fees are due in respect to this amendment, please also charge them to Gibbons, Del Deo, Dolan, Griffinger & Vecchione Deposit Account No. 03-3839.

Respectfully submitted,



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Version With Markings

IN THE CLAIMS

1. (Twice Amended) In a ROM device, a temperature compensation circuit to maintain a current through a selected one of a plurality of data resistors substantially constant comprising:

at least one reference resistor, wherein the conductivity of said reference resistor[s] is responsive to changes in temperature;

a constant current source coupled to said at least one reference resistor, said constant current source developing a voltage across said at least one reference resistor; and

at least one switch connected to said at least one reference resistor to selectively couple said voltage to a plurality of input word lines wherein the ROM device uses said plurality of data resistors to interconnect said plurality of input word lines with a plurality of output bit lines.

32. (Twice Amended) A method to maintain a current through Read-Only Memory (ROM) substantially constant as temperature changes, comprising the steps of:

supplying through at least one switch a reference voltage that is responsive to changes in temperature to a plurality of input lines, wherein said ROM employs a plurality of data resistors to provide electrical interconnections between said plurality of input lines and a plurality of

output lines and said reference voltage changes to maintain said current through said data resistors substantially constant.